

CONTINUATION-IN-PART

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**A SYSTEM AND METHOD FOR REPRESENTING AN ACTIVITY
INVOLVING A ROUTE ALONG A
PLURALITY OF LOCATIONS**

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**A SYSTEM AND METHOD FOR REPRESENTING AN ACTIVITY
INVOLVING A ROUTE ALONG A PLURALITY OF LOCATIONS**

CROSS REFERENCE TO RELATED APPLICATION

5 This is a continuation-in-part of commonly assigned application
U.S. Serial No. 09/769,986, entitled "A SYSTEM AND METHOD FOR
REPRESENTING AN ACTIVITY INVOLVING A ROUTE ALONG A
PLURALITY OF LOCATIONS", filed on January 25, 2001 in the names of
Fredlund et al, and which is assigned to the assignee of this application.

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FIELD OF THE INVENTION

The present invention relates to a system and method of capturing
and displaying data representing an activity along a plurality of locations, such as
golf or hiking.

15

BACKGROUND OF THE INVENTION

Golf courses provide score cards to allow the golfers to record their
scores. These score cards are useful in many ways. For example, generally a
course name and logo are displayed on the card. Course information is displayed
20 on the card so that the golfer will know approximate distances to the hole. Par
information is displayed for each hole. The golfer can record the number of
strokes taken to complete each hole, and upon completion of the course, can tally
up all strokes for the final score.

Golfers often retain score cards as a keepsake of the course, the
25 particular round, or the score on a particular hole. The score card is useful to
trigger the memory of the golfer, but it is a very limited keepsake. For example,
the score card is particularly limited in its visual aspects in that the recorded
numbers are a poor representation of success on the course, and of the physical
beauty of the course. Additionally, the score card provides limited information on
30 how the course was played by the golfer. The number of strokes is recorded, but
not the position or difficulty of the shots. Further, the score card does not lend
itself well to improving the golfer's game.

Similarly, hikers treasure the maps of routes they have taken, and often retain the maps as a keepsake. The hikers sometimes even manually record their routes on the maps. These maps are often large and unwieldy and often display areas well beyond the area of travel. In most cases the map is an
5 impersonal remembrance of the trip.

In US Patent No. 5,810,580, *Lobb* discloses a computer-aided game apparatus for providing information and for assisting a golfer during the progress of the game. The apparatus includes a printer to allow the golfer to download the golfer's game statistics. *Fraker*, in US Patent No. 5,434,789, shows
10 a golf diagnostic system that records ball positions on the basis of global positioning system (GPS) readings, and may be used for keeping track of scores obtained. In US Patent No. 5,507,485, *Fisher* shows a portable golf computer that is programmed to record a golfer's score, determine the location of the cart and/or golfer, and display the layout of each hole on the golf computer. None of the
15 aforementioned systems provide a keepsake of more value than a traditional score card.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a system that
20 automatically creates a record of an activity that is of superior aesthetic appeal and of more use for recording the specifics of the locations visited.

This object is achieved by creating an image representing an activity involving a route including visits to a plurality of locations, comprising the steps of:

- 25 a) providing a participant in the activity with a recording device for recording the coordinates of his location;
- b) participating in the activity accompanied by the recording device; and
- c) employing the coordinates recorded by the recording device
30 to produce an image showing the route taken by the participant during the activity.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts a device used for recording ball placement and recording strokes;

FIG. 2 is a block diagram of the device shown in FIG. 1;

FIG. 3 is a diagram of a system for creating a record of an activity
5 according to the present invention;

FIG. 4 is a diagram showing a golf course and a route taken by a particular golfer produced according to one embodiment of the present invention;

FIG. 5 depicts a golfing keepsake produced according to an alternative embodiment of the present invention;

FIG. 6 depicts a golfing keepsake in accordance with the present
10 invention;

FIG. 7 is a flowchart of a method that implements the present invention; and

FIG. 8 depicts a keepsake provided to a hiker in accordance with
15 the present invention.

FIG. 9 shows a networked recording device displaying analysis information.

DETAILED DESCRIPTION OF THE INVENTION

20 In general, the present invention can be used to record a particular route taken during an activity and produce a keepsake, such as a map, showing the route taken. The keepsake may be a print of an image, or other object bearing an image, such as a map, postcard, tee-shirt, mug, or album. The activity may be discrete or be comprised of a round of activity. Examples of such activities
25 include golfing, hiking, long distance running, mountain climbing, fishing, bicycling, skiing, boating, road rallies, and vacation travel. For ease of explanation, the present invention will be described using the activity of golfing.

Figure 1 shows a recording device used in accordance with the present invention to record the stroke locations in a round of golf. The recording
30 device **10** includes a ball placement button **12** that is pressed whenever the golfer is about to strike the ball. Alternatively, the ball placement button **12** may be actuated just after the ball is struck. The golfer stands at the stroke location and

presses the placement button **12** whenever a stroke is taken. Alternatively, a remote triggering device **14** may be provided to remotely trigger recording device **10**. That is, the golfer wears the recording device **10** and a caddy or playing partner, triggers a ball placement button **12** disposed on the remote triggering device **14** to record the position of the ball for each stroke. The recording device **10** records that a stroke has been taken, and the location on the course where the ball placement button **12** was pressed. In this manner, the number of strokes and the location from which each stroke was taken is recorded.

The recording device **10** may also include a hole button **16** that is pressed when the golfer has sunk a putt in the hole. When the hole button **16** is pressed, the recording device **10** will record that the golfer has finished the hole and record the score for that hole. Alternative means may be used to record the finish of a hole such as a double actuation, or a long duration actuation of the ball placement button **12**. Another alternative is a sensor disposed in the bottom of the cup on the green, indicating that the golfer has sunk a putt in the hole, thereby recording that the golfer has finished the hole. A bar code on the golfer's ball may be a further alternative.

Other buttons (not shown) or button functionalities (implemented for example by a touch screen) may be included on the recording device **10** (and/or remote triggering device **14**) to enable the recording device **10** to record events such as lost balls, penalties, and mulligans. There also may be provisions for correcting errors in capturing ball placement or number of strokes. Provision may also be provided for recording the number of the club (e.g. 5 iron, or 3 wood) used for each stroke.

The recording device **10** also includes a display **18** for showing the number **20** of the hole, the number of strokes **22** that the golfer has taken on the hole he is playing, and the total current cumulative score **24**. Other numerical data such as distance to the hole **26** (calculated on the basis of present device position and known hole position), par for the current hole **28**, or wind direction and speed (not shown) may also be displayed. Data such as the wind direction and speed, and par for the hole may be provided via a radio frequency (RF) link from a remote location, such as the club house, or by other means known to those skilled

in the art. Additionally, the display **18** may be used to show graphical information, such as pin placement on the green or location of hidden hazards. More detailed information may be displayed, such as club selection for shots, or altitude changes from present position to hole. The recording device **10** may be
5 loaded with the particulars of the course at the image processing computer or other station containing the data pertinent to the course. By this means, the recording device **10** may display data for the golfer such as distance to hole, or hidden hazards. The display **18** may be a touch screen so that the ball placement button **12** and hole button **16** are implemented by the touch screen. As with the
10 display **18**, a touch screen display can also be used to correct errors in capturing ball placement or number of strokes.

The recording device **10** may also comprise a digital camera **25** having a taking lens **27** located on the recording device **10**. The digital camera **25** may be used to capture images during the round of golf, which images can be
15 stored along with the GPS coordinates of the recording device **10** location at the time of image capture in memory. The images can then be used as described below in creating a keepsake of the activity.

The data loaded/transferred to the recording device **10** may include historical data on the performance of one or more of the golfers. The golfer can
20 become aware of tendencies of a population or of his own prior rounds in this fashion. This awareness may improve the golfer's score.

A single recording device **10** could be used for an entire foursome. The recording device **10** would be placed at the site of each golfer's stroke, or a means may be provided for determining the offset of each golfer's ball position
25 from the position of the recording device **10**. For example, if the recording device **10** includes an infrared range-finder and a compass, such offsets may be provided automatically by the recording device **10**.

Figure 2 shows a block diagram of the recording device **10**. The recording device **10** includes a power supply **30**, such as a battery, and a
30 microprocessor **32**. A memory **34**, a global position system (GPS) **36**, and a data link **38** are connected to the microprocessor **32**. Recording device **10** may optionally comprise other components connected to the microprocessor **32**. For

example, if images are to be collected, the digital camera **25** would be connected to the microprocessor **32**. If data regarding date and/or time is to be collected, a clock **37** would be connected to microprocessor **32**. Similarly, if data regarding altitude is to be collected, an altitude sensor **39** (such as an altimeter) would be connected to microprocessor **32**. The data link **38** can be a data port such as a USB or RS 232 port, or an RF link such as a "BLUETOOTH" RF module. Inputs to the recording device **10**, such as by the aforementioned ball placement button **12**, hole button **16**, or the touch screen on display **18**, are shown in Figure 2 as user input **40**. The user input **40** are connected to the microprocessor **32**. In a preferred embodiment, the golfer presses the ball placement button **12** and the microprocessor **32** detects the button press. The microprocessor **32** increments a stroke-counter in memory **34** and detects the position information from the GPS **36** and stores the position information along with a stroke number in memory **34**. The display **18** may be updated accordingly to reflect the most recent stroke and distance to hole. The data link **38** provides for downloading to the microprocessor **32** of information pertinent to the course such as par and location of pins and uploading from the microprocessor **32** of stroke and location information captured during the activity to a peripheral device such as an image processing computer or printer, as described below.

Other suitable means known to those skilled in the art for triangulating a location may be employed, such as a cell tower, to detect the coordinates of the golfer's location.

Figure 3 shows a system in accordance with the present invention comprising an image processing and printing station **42**. The station **42** includes an computer **44** for processing image and data information (hereinafter, computer **44** is referred to as image processing computer **44**), a user interface **46**, such as a keyboard, a computer display **48**, and an output device or printer **50**, , such as an ink jet or thermal printer, all adapted to be connected to the computer **44**. The image processing and printing station **42** may also include a digital camera **52** attached to the image processing computer **44**. The digital camera **52** may be used to capture an image of the golfer and the captured image would be integrated into a keepsake as described below. The image processing and printing station **42** may

be located for example behind the counter of a pro shop, or preferably as a free standing kiosk located in the pro shop or the club house.

The image processing computer 44 is configured to process the information provided by the recording device 10 and produce an output or output
5 image that is prepared by printer 50. An example of an output image is shown in Figure 4. As shown Figure 4, the output image may be a shot map 54 that includes an outline of the golf course showing the location of a tee 56, fairway 58, green 60 (with pin placement 62) for each hole of the course. The golfer's shot locations 64 (represented in Figure 4 by dots) and approximate ball trajectories 66
10 (represented in Figure 4 by lines) are illustrated on the golf course outline. A dot (i.e., shot location 54) and line (i.e., ball trajectory 56) correspond to each stroke the golfer took in the round. The progress of the golfer from tee to hole is displayed graphically on the shot map 54. In areas where the resolution of the shot map 54 or the resolution of the GPS system is inadequate to show the discrete
15 strokes, such as on the green, a single line 68 may be used with a number 70 beside it to indicate the number of strokes. For example, in Figure 4, the number 70 next to the line 68 is "3", representing that the golfer took 3 strokes over this distance. The shot map 54 may be a realistic image of the terrain of the golf course, a photograph, such as an aerial photograph, or a realistic rendering of the
20 terrain. Alternatively, the shot map 54 may be a topographical map of the terrain traversed by the route.

Outputs other than a shot map can be generated by the system in accordance with the present invention. For example, Figure 5 shows an output 72
suitable as a keepsake. The keepsake image shown in output 72 relates to one
25 particular hole that has been selected from the round of golf for display. The particular hole selected may have been notable, for example, for the golfer's low score or the difficulty associated with the hole. In the keepsake shown in Figure 5, the output 72 is a composite image comprising , the golfer's portrait 74, which has been captured by the digital camera 52 attached to the image processing
30 computer 44. A date 76 of the activity may be provided automatically by the image processing computer 44, or manually input by an operator. The keyboard 46 may be used to select one particular hole 78 (e.g. hole number 5) and an

associated realistic image **80** (such as a photographic or rendered image) of the particular hole, and to input other information such as the golfer's name **82** and a description **84** of the results of the hole. The keyboard may also be used to input personal comments by the golfer to reflect memorial moments about the activity.

5 The image processing computer **44** generates a composite image comprising the user-supplied inputs and previously supplied images of the particular hole that has been selected. Optionally, a club logo and name **86** may be incorporated into the composite image. The composite image is then output on the printer **50** and available for the customer as a remembrance of the activity. In the event that the
10 system of the present invention is incorporated as a kiosk or automatically operated system, the inclusion of automatic means of payment may be desirable. For example, the kiosk may be provided with a means for receiving payment, such as a credit card reader (not shown) known to those skilled in the art.

As described above, the digital image may comprise alphanumeric
15 information and/or iconic information, such as a golf course/club logo and name **86**. Such information disposed in the digital image may also include personally-identifiable information, that is, information attributable to the participant. For example, the golfer's name, age, date of birth, handicap, golfer's image, club selection, quotes, comments, and personal reflections.

20 The representation of the route taken by the golfer may be graphically connected by means of lines, dots, or a combination thereof, for example, dashed lines or a sequence of dots. Figure 6 illustrates a route taken by a golfer graphically connected by dashed lines. Figure 6 also illustrates the route shown in exaggerated form, thereby enhancing the keepsake. If the routes of
25 multiple golfers are shown in one digital image, the route of each golfer may be represented by a different graphical connection.

Turing now to Figure 7, the operation of the system in accordance with the present invention is now described with reference to a flowchart. The recording device **10** is configured/loaded **90** with the particulars of the golf course
30 prior to the golfer beginning the round of golf by means of the data link **38**. Additionally, the recording device **10** may be configured/loaded with the name, or a code corresponding to the identity of the golfer. When the golfer is preparing to

take a stroke, he records the stroke **92** by pressing the ball placement button **12**. If the hole is not completed **94** with this stroke, the golfer will repeat the process on the next stroke. If the hole is completed, the golfer records the completion by pressing the hole button **16**. This sequence is repeated **96** until all the holes on the round are completed.

When all the holes on the round are completed, the recording device **10** is connected **98** to the image processing computer **44** to upload the captured information. As described in more detail above, the recording device **10** may be connected to the image processing computer **44** via an RF link during play. This RF link allows connectivity during play, and will allow the image processing computer **44** to display the performance of the golfer while the round is in progress. This may be desirable if the golfer or many golfers are competing in a tournament. In the case where the recording device **10** is connected to the image processing computer **44** at the end of the activity, the recording device **10** uploads the captured information to the image processing computer **44** at this time **100**. Preferably, the captured information includes the GPS position of the golfer for each stroke. Other uploaded information may be an ID for the golfer, club selection for each shot, or images/scenes captured during the round if the recording device **10** is equipped with the digital camera **25**.

After the captured information is uploaded, the image processing computer **44** will plot **102** each stroke on the shot map **54** in accordance with known locations on the course map and the ball positions recorded by the golfer. The known locations on the course map are previously loaded into the image processing computer **44**. The shot map **54** is displayed, the image processing computer **44** sends **104** the print file to the printer **50**, and the shot map is printed **106** on printer **50**. The image file of the shot map **54** may additionally be saved to a file on a medium, such as a floppy disk or CD. Such output enables the golfer to view an on-screen representation of his round. Additionally, the image file may be sent to an e-mail address designated by the customer/golfer. Optionally, in addition to documenting the round of one golfer, the shot map **54** may include information corresponding to the shots of other golfers using, for example,

different shapes to designate the different golfers, and providing a legend relating the shapes to the identities of the different golfers.

In addition to providing a keepsake image representing a round or hole of golf, the system of the present invention may be used to create keepsake
5 images for other activities such as hiking, fishing, long distance running, mountain climbing, fishing, bicycling, skiing, boating, road rallies, and vacation travel. For such activities, the participant may carry the recording device 10. The recording device 10 would be enabled with buttons to initiate recording of locations, or may be programmed to record locations at regular intervals. In the latter case, the
10 participate/user does not need to regularly actuate the record device 10 to record locations, but rather, would start the recording at the beginning of the activity thereby allowing the recording device 10 to automatically record the activity at regular intervals. If the recording device 10 has a display 18, it may also be used to display the user's location on a map previously loaded into the recording device
15 10 as is known to those familiar in the GPS art.

In addition to the system of the present invention being used to record a particular route taken during an activity and produce a map or keepsake showing the route taken, the system of the present invention can be used as a safety and maintenance tool by the golf course. That is, if the golf course is able
20 to track where the golfer's balls, and thereby the golfers, have been positioned, the grounds crew of the golf course can better understand the areas of the golf course that may require additional maintenance, for example, to repair divots. More specifically, the present invention can be used to record the lie of the golfer's golf ball. By collecting the information on a plurality of golfers, the grounds crew can
25 determine the high traffic locations on the course, since these traffic areas may require additional maintenance. In a preferred embodiment, an output device would generate a digital image showing the coordinates of the locations recorded by the recording device to indicate candidate locations of the terrain requiring maintenance. It is noted that such a maintenance system for determining
30 candidate maintenance locations can be applied to other activities wherein a terrain is traversed by a plurality of participants. For example, hikers to determine locations for rest stop facilities or skiers to determine grooming areas.

Accordingly, the present invention can provide a method of maintaining a terrain traversed by a plurality of participants along a route having a plurality of locations, comprising the steps of: providing each of the plurality of participants with a recording device for recording, at various times, a coordinate of the locations of the terrain traversed by each of the plurality of participants; downloading the coordinates of the locations to an image processing computer; and generating a digital image showing the locations recorded by the recording device to indicate locations of the terrain requiring maintenance. A maintenance system for a terrain traversed by a plurality of participants would comprise: a recording device for recording a coordinate of the locations of the terrain at various times for each of the plurality of participants; an image processing computer programmed for generating a digital image showing the locations recorded by the recording device; a link for downloading the coordinates of the locations to the image processing computer; and an output device for generating the digital image showing the coordinates of the locations recorded by the recording device to indicate locations of the terrain requiring maintenance.

Alternatively, if the managers of the golf course understand where errant golf shots are most frequent (for example, tee shots being directed toward homes built adjacent the gold course or an adjacent green), the managers may be able to modify the golf course to improve the safety for the golfers, for example, by growing natural barriers or placing netting to deflect errant shots.

Pin placement can also be determined. That is, knowing where many of the golf balls land on the green from an approach shot, the golf course can strategically place the pin to make the hole more challenging.

In a manner similar to creating the shot map **54** for golfing, if the participant/user is involved in the activity of hiking, a trail map **110** may be created as a keepsake. That is, the recording device **10** may upload the captured location coordinates from the recording device **10** into the image processing computer **44**. The image processing computer **44** uses the coordinates to create the trail map **110** as shown in Figure 8 that shows the route **112** (shown in dashed lines) taken by the hiker. The trail map **110** is then displayed and printed as described above.

As described above, the recording device **10** may include the clock **37**, preferably as part of the microprocessor **32** for recording date and time information along with the GPS coordinate data. If data and time are recorded with each location, the trail map **110** may also show progress along the trail.

5 Icons **114** may be added at or adjacent to locations where an event has occurred. For example, a significant time is spent at a campsite, or the siting of wildlife. Inclusion of times on the map may be of greater significance for sports such as long distance running.

The system of the present invention is also useful for other
10 activities. For mountain climbing, altitude may be equally important as location, and the altitude sensor **39** may be included in the recording device **10**. Fishermen may use the system for providing a keepsake detailing size, weight, location and times of fish caught. Accordingly, fish weight can be input as data to the recording device **10**.

15 Vacationing travel may also be chronicled by the system, whereby the output could be a roadmap sized appropriately to the length of the trip.

The keepsake can be a video or a collection of digital still images. Images and voice commentary can be captured/recorded during the activity to include in the video keepsake. The video keepsake can include previously
20 acquired images a well-know golf professional playing the same golf hole as the player to show/simulate how a golf pro would play/shot on the hole.

In a further embodiment, the present invention can be configured as a networked imaging device, for example, a camera, cellular or mobile telephone, PDA (personal digital assistant), or video camera. That is, recording
25 device **10** can include or be a component of such networked imaging devices. The networked recording device can further include a GPS, altimeter, and the like. Such an arrangement will provide for live conditions and live input. For example, an image can be captured/acquired using recording device **10** and then transmitted to another location, such as another player on the course or the course club house.
30 In another example, an image can be captured/acquired using recording device **10** and then analyzed. The analysis can include wind conditions (e.g., speed and direction), distance to a hole, surface conditions, and the like. The analysis can

result in club suggestions, suggested hold approaches, stroke information, and the like, such as illustrated in Figure 9. Such information can be recorded on the keepsake.

5 Still further, with such a networked arrangement, the golf course can determine the speed/progress of the players on the course, for example, to set tee-times or give time estimates to players waiting to play. Such information can be current and not require a course attendant to travel onto the course. This will allow the course to determine the slow areas of play.

10 With the networked imaging device, cameras or other imaging devices disposed on the golf course can be accessed to better analyze the lie of the ball and how to proceed. The camera can provide a graphic/image for the golfer. For example, if the green cannot be seen, it can be accessed using the networked imaging device. If such cameras are employed with other activities along the terrain, for example with hiking, the conditions to where the hiker is traveling can
15 be reviewed.

The keepsake generated can be previewed and/or ordered using the recording device, thereby allowing the keepsake to be available upon returning to the course club house (or other central location, such as a ranger station if employed for hiking or skiing).

20 The recording device can also be configured to display/track the positions/locations of other players on the course. Golf score information can also be displayed. In another configuration, the recording device can be used to place a call for assistance or course concessions.

25 The invention has been described in detail with particular reference to a presently preferred embodiment, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention. The presently disclosed embodiments are therefore considered in all respects to be illustrative and not restrictive. The scope of the invention is indicated by the appended claims, and all changes that come within the meaning and range of
30 equivalents thereof are intended to be embraced therein.

PARTS LIST

10	recording device
12	ball placement button
14	remote triggering device
16	hole button
18	display
20	number
22	number of strokes
24	total current cumulative score
25	digital camera
26	distance to the hole
27	taking lens
28	par for hole
30	power supply
32	microprocessor
34	memory
36	global position system
37	clock
38	data link
39	altitude sensor
40	user input
42	image processing and printing station
44	image processing computer
46	user interface; keyboard
48	computer display
50	output device
52	digital camera
54	shot map
56	tee
58	fairway
60	green
62	pin placement

64	shot locations
66	ball trajectories
68	line
70	number
72	output keepsake
74	golfer's portrait
76	date of activity
78	selected particular hole
80	associated realistic image
82	name
84	description
90	loaded
92	record
94	hole completed
96	round completed
98	connected
100	uploaded
102	plot
104	send
106	print
110	trail map
112	route
114	icons